

Phase Diagrams for Ceramists

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Compiled at the National Bureau of Standards

Margie K. Reser, *Editor*

FIFTH PRINTING 1985

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The American Ceramic Society
65 Ceramic Drive, Columbus, Ohio 43214

Printed in U.S.A.

ISBN 0-916094-04-9

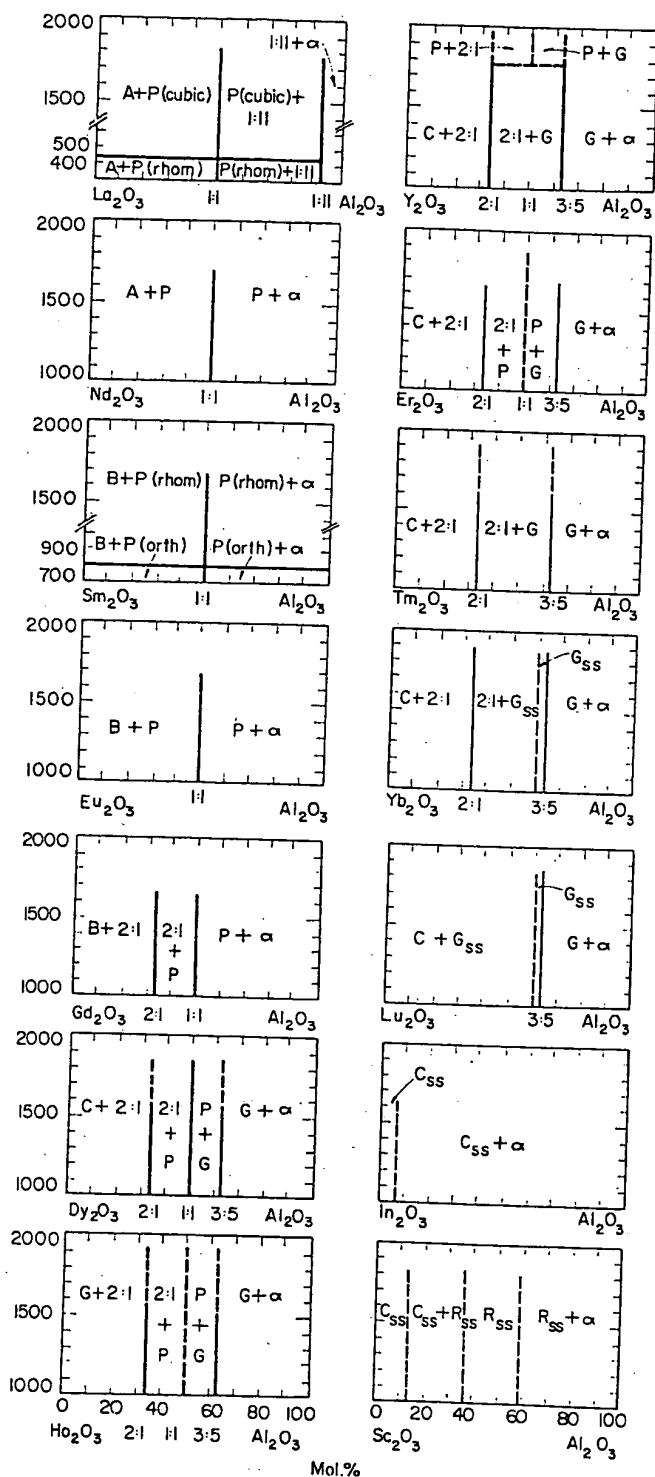
$\text{Al}_2\text{O}_3\text{-R}_2\text{O}_3$ 

FIG. 312.—System $\text{Al}_2\text{O}_3\text{-R}_2\text{O}_3$; predicted subsolidus. Structure types: A, A-type rare earth oxide; B, B-type rare earth oxide; C, C-type rare earth oxide; G, garnet; 1:11, beta alumina; P, perovskite; R, unknown, rhombohedral symmetry; α , corundum.

S. J. Schneider, R. S. Roth, and J. L. Waring, *J. Research Natl. Bur. Standards*, 65A [4] 364 (1961).

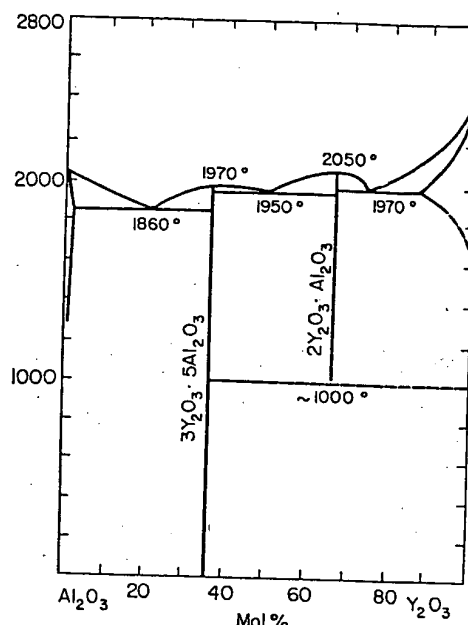
 $\text{Al}_2\text{O}_3\text{-Y}_2\text{O}_3$ 

FIG. 311.—System $\text{Al}_2\text{O}_3\text{-Y}_2\text{O}_3$.

L. E. Olds and H. E. Otto, private communication, Dec. 27, 1961. Fig. 312 indicates additional 1:1 compound; see also, I. Warshaw and Rustum Roy, *J. Am. Ceram. Soc.*, 42 [9] 435 (1959).

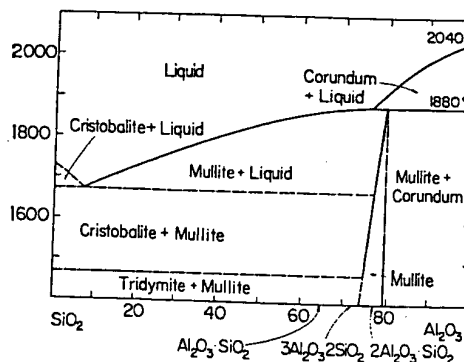
 $\text{Al}_2\text{O}_3\text{-SiO}_2$ 

FIG. 313.—System $\text{Al}_2\text{O}_3\text{-SiO}_2$; redetermined.

J. W. Welch, *Nature*, 186 [4724] 546 (1960); also *Trans. Intern. Ceram. Congr., 7th London*, 1960, 1961, pp. 197-206. See also: G. Trömel, K.-H. Obst, K. Konopicky, H. Bauer, and I. Patzak, *Ber. deut. keram. Ges.*, 34 [12] 401 (1957); E. C. Shears and W. A. Archibald, *Iron & Steel*, 27 [26] 61 (1954); N. L. Bowen and J. W. Greig, *J. Am. Ceram. Soc.*, 7 [4] 242 (1924).

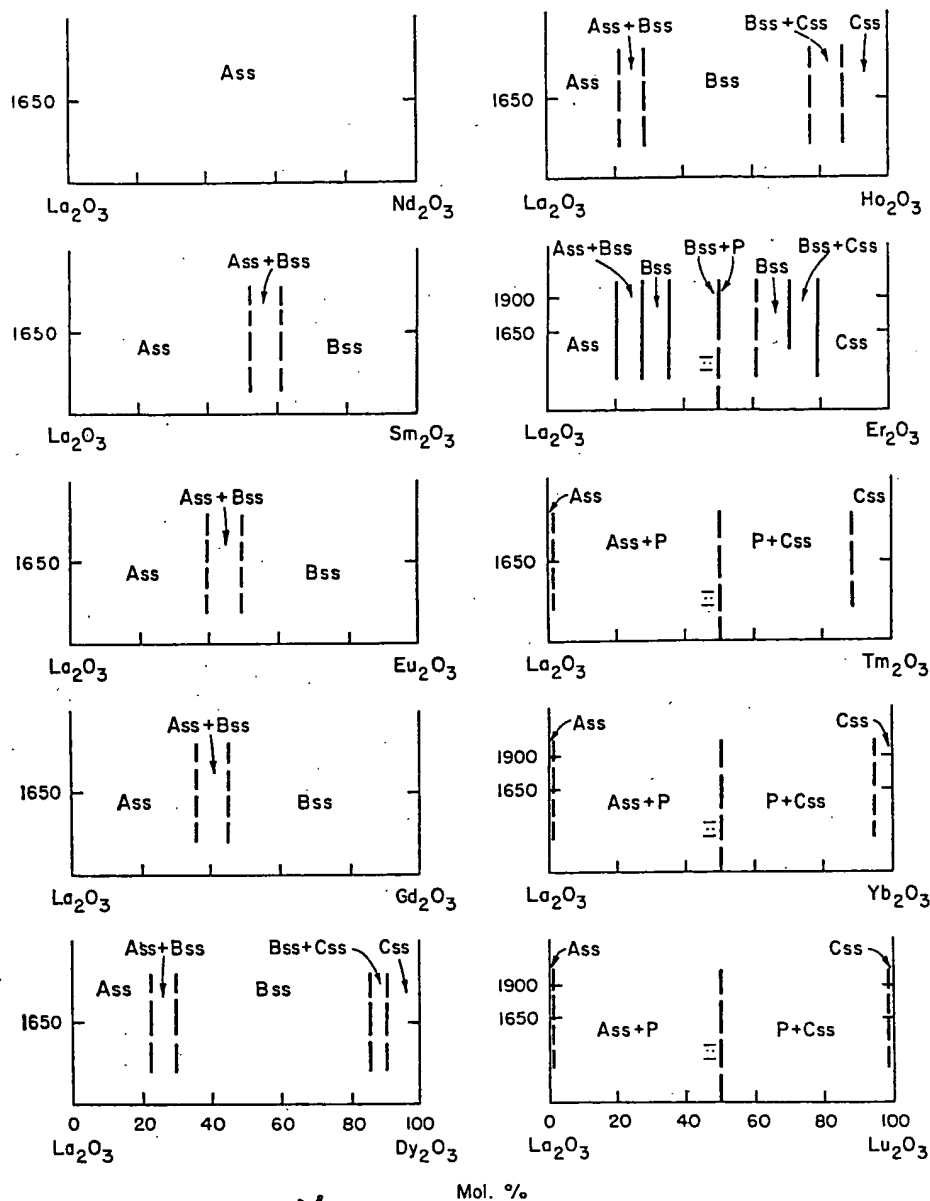
La₂O₃-Ln₂O₃

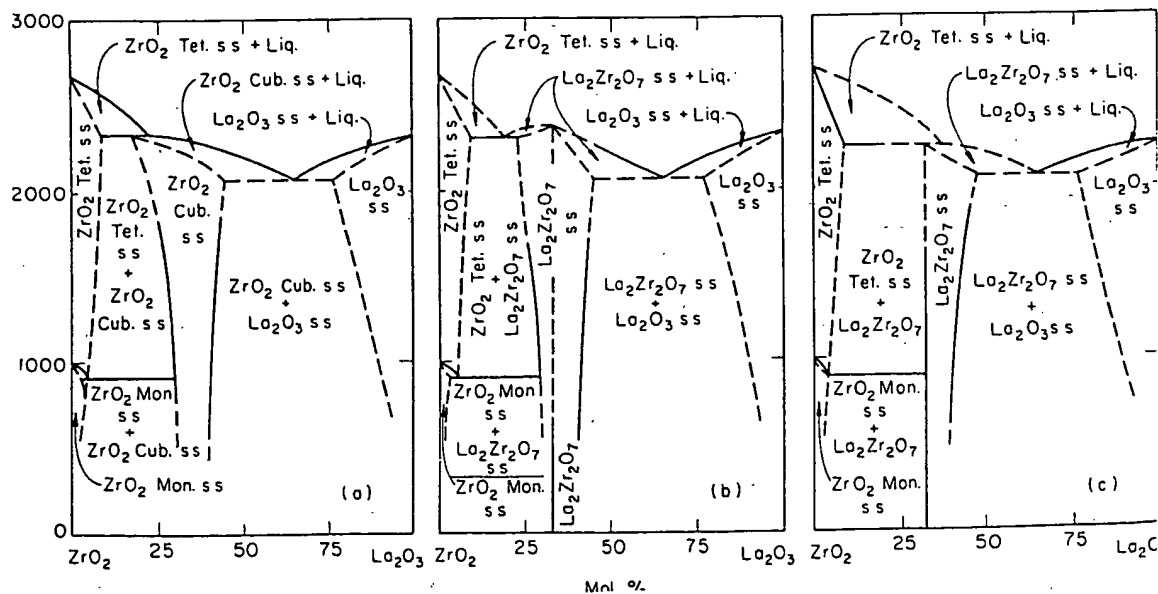
FIG. 345.—System La₂O₃-Ln₂O₃; predicted subsolidus. A, B, C refer to rare earth oxide structure types; P, perovskite.

S. J. Schneider and R. S. Roth, *J. Research Natl. Bur. Standards*, 64A [4] 325 (1960).

La₂O₃-ZrO₂

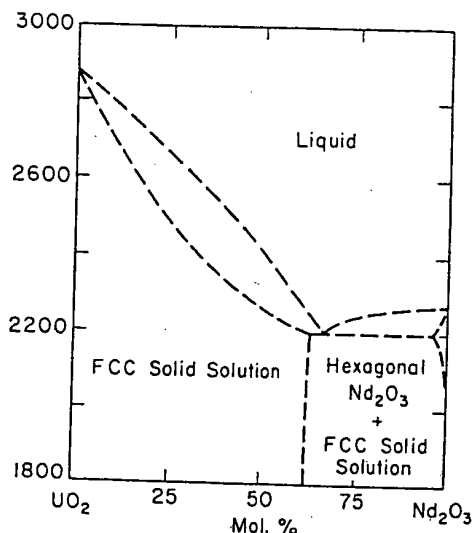
FIG. 346.—System La₂O₃-ZrO₂; possible.

R. S. Roth, *J. Research Natl. Bur. Standards*, 56 [1] 23 (1956); RP2643 (a) After F. H. Brown, Jr., and F. Duwez, *J. Am. Ceram. Soc.*, 38 [3] 9 (1955); (b) showing La₂Zr₂O₇ meltin congruently with solid solution on bot sides; (c) showing La₂Zr₂O₇ meltin incongruently, with solid solution onl on high La₂O₃ side.



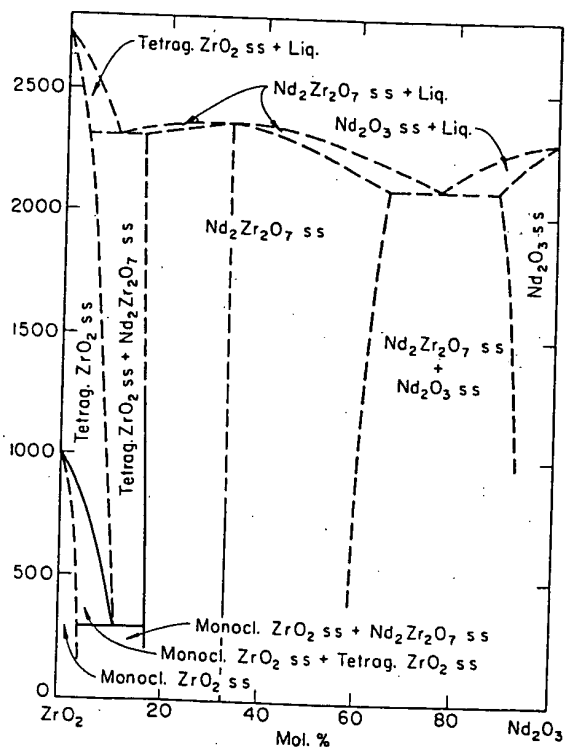
Mol. %

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$\text{Nd}_2\text{O}_3\text{-UO}_2$ FIG. 349.—System $\text{Nd}_2\text{O}_3\text{-UO}_2$.

S. M. Lang, F. P. Knudsen, C. L. Fillmore, and R. S. Roth, *Natl. Bur. Standards Circ.*, No. 568, p. 16 (Feb. 20, 1956).

After W. A. Lambertson and M. H. Mueller, U. S. AEC unclassified report ANL-5312 (Sept. 14, 1954).

 $\text{Nd}_2\text{O}_3\text{-ZrO}_2$ FIG. 350.—System $\text{Nd}_2\text{O}_3\text{-ZrO}_2$; possible.

Modification showing $\text{Nd}_2\text{Zr}_2\text{O}_7$ solid solution phase after R. S. Roth, *J. Res. Natl. Bur. Std.*, 56 [1] 24 (1956); RP 2643. Remainder of diagram after F. H. Brown, Jr. and Pol Duwez, *J. Am. Ceram. Soc.*, 38 [3] 95 (1955).

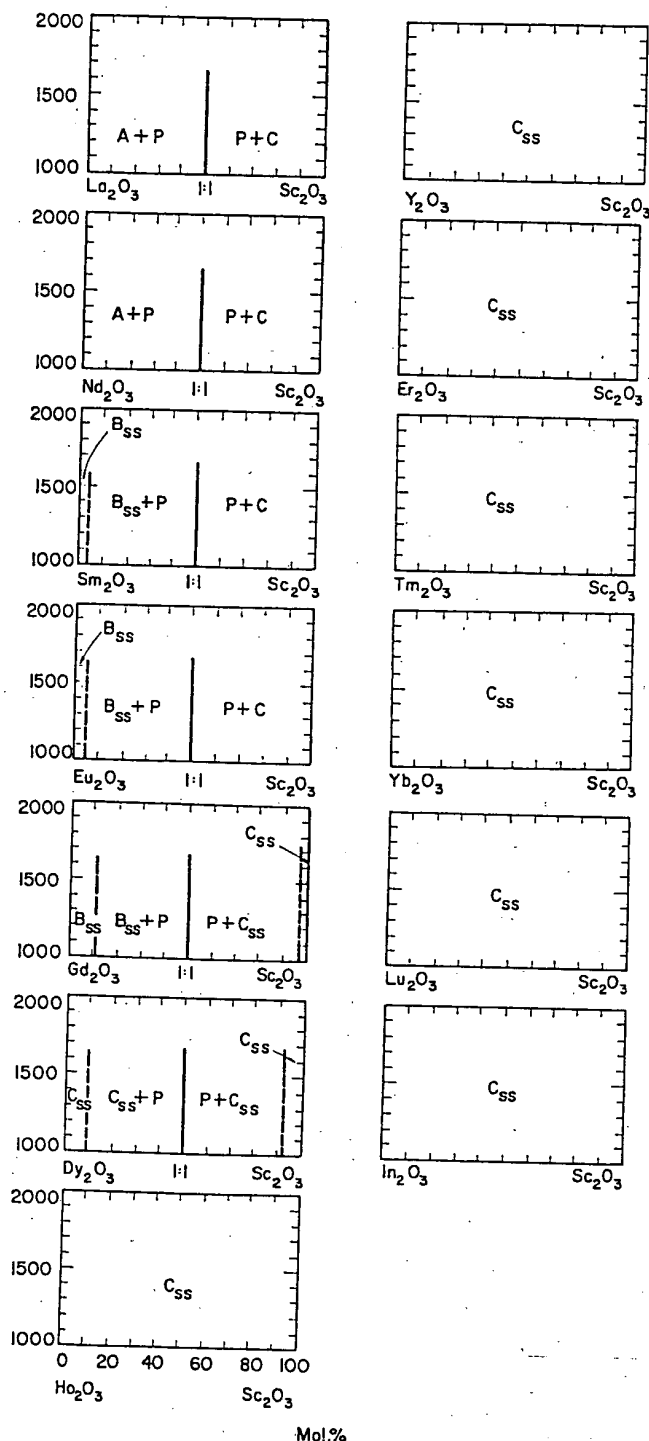
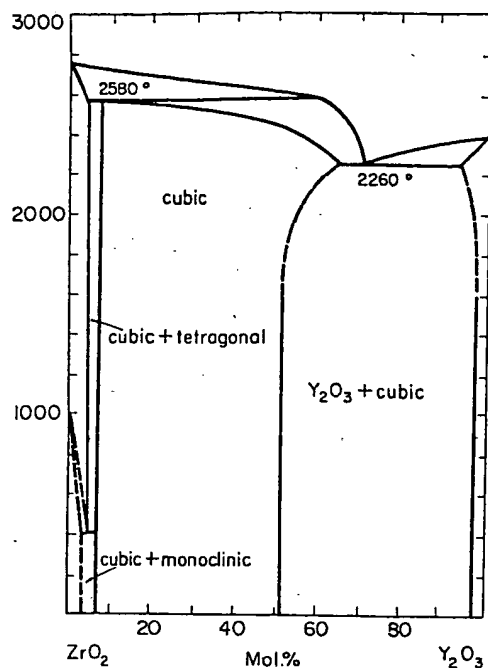
 $\text{Sc}_2\text{O}_3\text{-R}_2\text{O}_3$ 

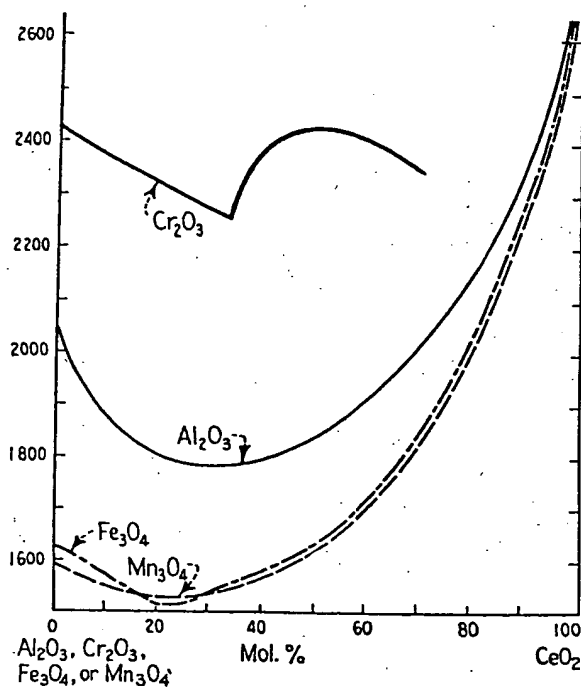
FIG. 351.—System $\text{Sc}_2\text{O}_3\text{-R}_2\text{O}_3$; predicted subsolidus. Structure types: A, A-type rare earth oxide; B, B-type rare earth oxide; C, C-type rare earth oxide; P, perovskite.

S. J. Schneider, R. S. Roth, and J. L. Waring, *J. Research Natl. Bur. Standards*, 65A [4] 370 (1961).

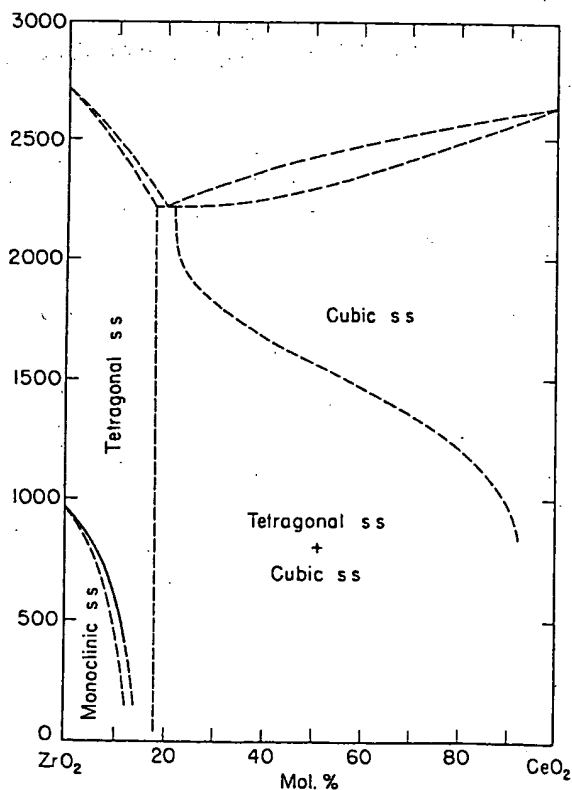
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$\text{Y}_2\text{O}_3\text{-ZrO}_2$ FIG. 354.—System $\text{Y}_2\text{O}_3\text{-ZrO}_2$.

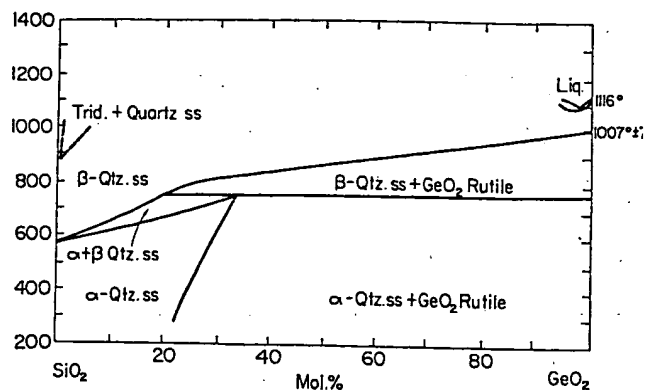
H. E. Otto, private communication Dec. 27, 1961. See also, P. S. Duwez, F. H. Brown, Jr., and F. Odell, *J. Electrochem. Soc.*, 98, 360 (1951).

 $\text{CeO}_2\text{-R}_2\text{O}_3, \text{R}_3\text{O}_4$ FIG. 356.—Liquidus curves of systems $\text{CeO}_2\text{-Al}_2\text{O}_3$, $\text{CeO}_2\text{-Cr}_2\text{O}_3$, $\text{CeO}_2\text{-Fe}_3\text{O}_4$, $\text{CeO}_2\text{-Mn}_3\text{O}_4$.

H. von Wartenberg and K. Eckhardt, Part VIII, *Z anorg. u. allgem. Chem.*, 232, 184 (1937)

 $\text{CeO}_2\text{-ZrO}_2$ FIG. 355.—System $\text{CeO}_2\text{-ZrO}_2$.

Pol Duwez and Francis Odell, *J. Am. Ceram. Soc.*, 33 [9] 280 (1950).

 $\text{GeO}_2\text{-SiO}_2$ FIG. 357.—System $\text{GeO}_2\text{-SiO}_2$. Qtz. = quartz; Trid. = tridymite.

E. C. Shafer and Rustum Roy, *U. S. Army Signal Corps Contract DA 36-039, SC 63099* (1956).

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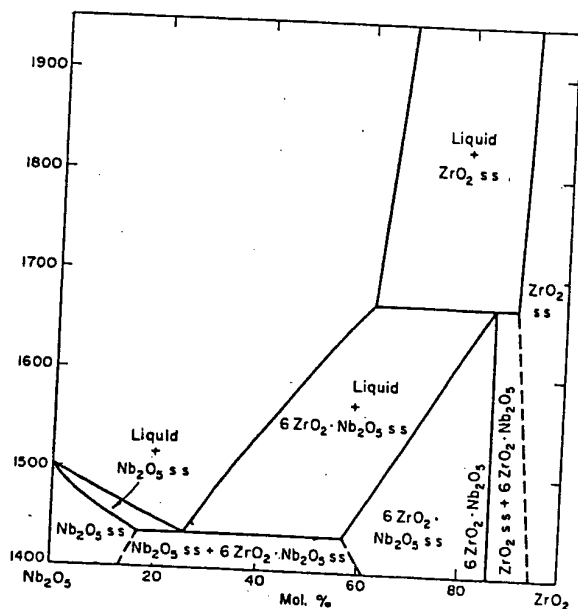
$\text{ZrO}_2\text{-Nb}_2\text{O}_5$ 

FIG. 373.—System $\text{ZrO}_2\text{-Nb}_2\text{O}_5$. ss = solid solution.
R. S. Roth and L. W. Coughanour, *J. Research, Natl. Bur. Standards*, 55 [4] 212 (1955); RP2621.

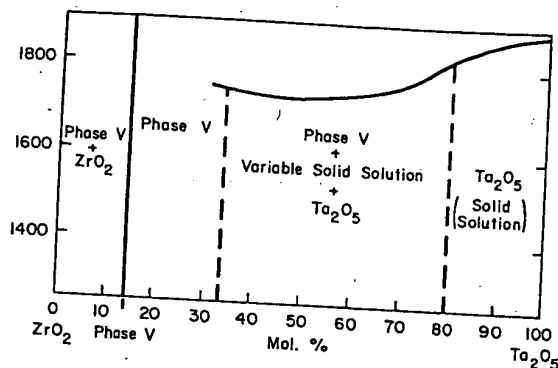
 $\text{ZrO}_2\text{-Ta}_2\text{O}_5$ 

FIG. 374.—System $\text{Ta}_2\text{O}_5\text{-ZrO}_2$.

B. W. King, John Schultz, E. A. Durbin, and W. H. Duckworth, U. S. Atomic Energy Comm., BMI-1106, 15 (1956).

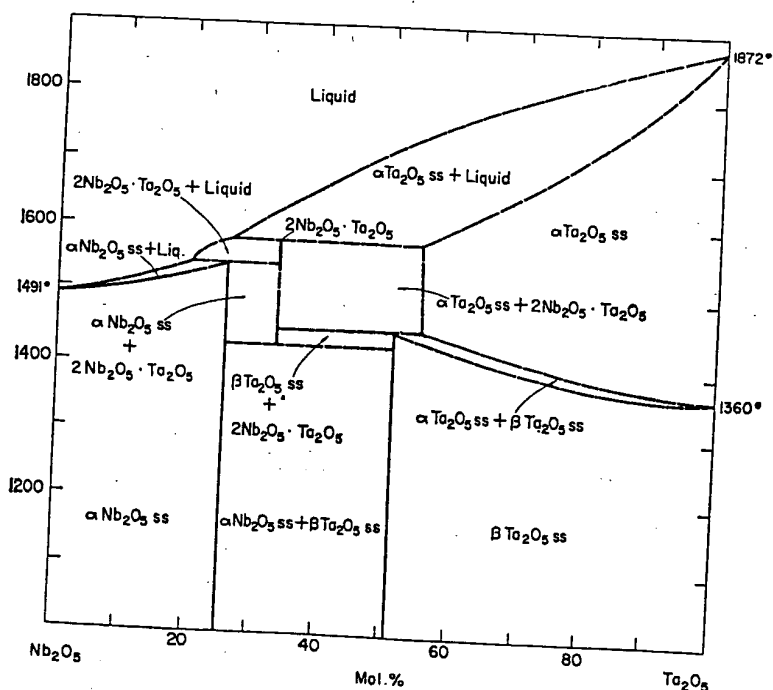
 $\text{Nb}_2\text{O}_5\text{-Ta}_2\text{O}_5$ 

FIG. 375.—System $\text{Nb}_2\text{O}_5\text{-Ta}_2\text{O}_5$.
F. Holtzberg and A. Reisman, *J. Phys. Chem.*, 65, 1193 (1961).

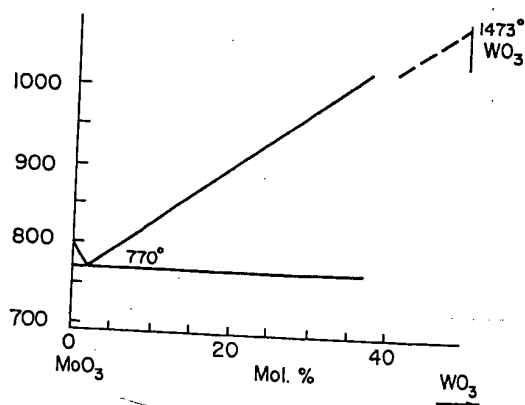
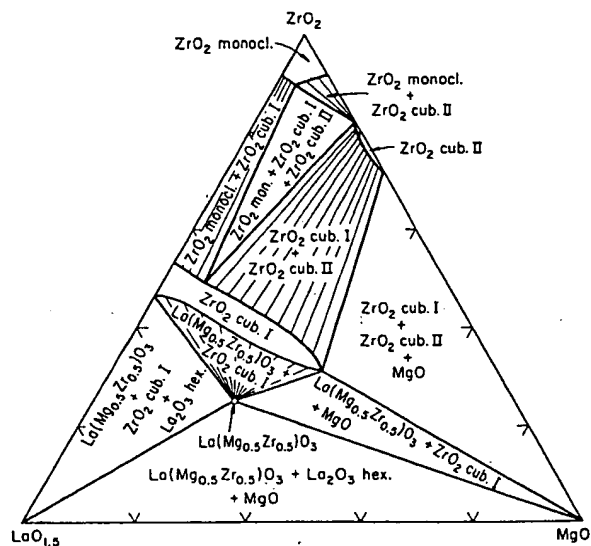
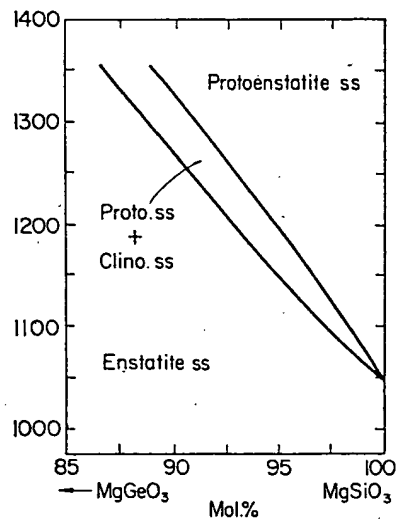
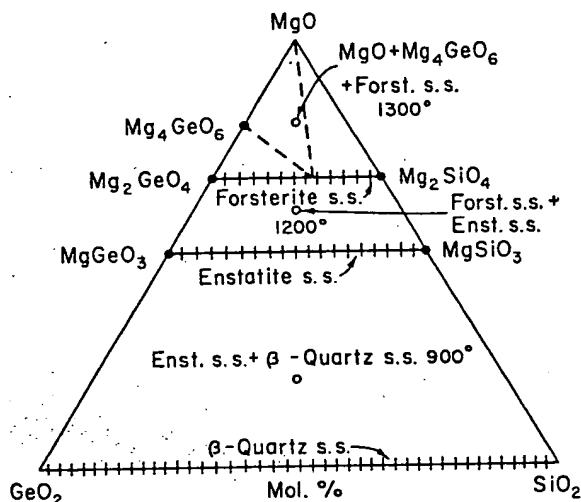
 $\text{MoO}_3\text{-WO}_3$ 

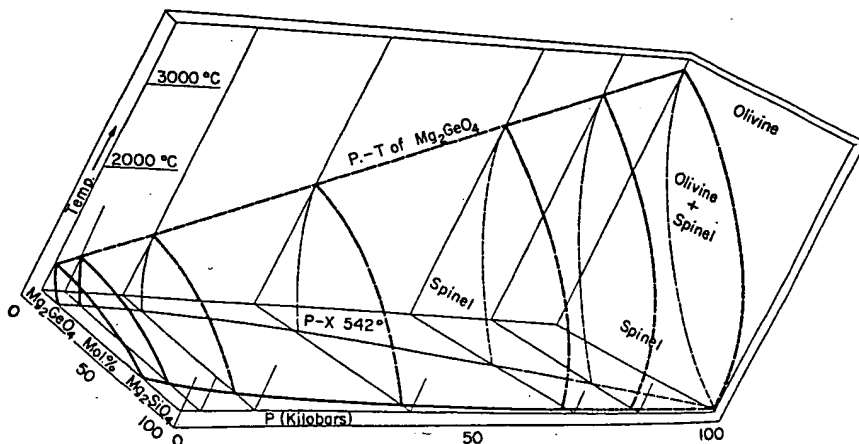
FIG. 376.—System $\text{MoO}_3\text{-WO}_3$.
G. D. Rieck, *Rec. Trav. Chim.*, 62, 429 (1943)

MgO-La₂O₃-ZrO₂FIG. 716.—System MgO-La₂O₃-ZrO₂; at approx. 1400°C.Albrecht Rabenau, *Z. anorg. u. allgem. Chem.*, 288, 224 (1956).FIG. 718.—System MgGeO₃-MgSiO₃; partial subsolidus. Clino. = clinoenstatite; Proto. = protoenstatite.

J. F. Sarver and F. A. Hummel, personal communication, Nov., 1961.

MgO-GeO₂-SiO₂FIG. 717.—System MgO-GeO₂-SiO₂; partial subsolidus. Solid solutions indicated by hatched lines.

J. F. Sarver and F. A. Hummel, personal communication, Nov., 1961.

FIG. 719.—System Mg₂GeO₄-Mg₂SiO₄; pressure-temperature-composition perspective. Isothermal section at 542°C. (uniaxial pressure) provides basis of construction.Frank Dacheille and Rustum Roy, *Am. J. Sci.*, 258, 236 (1960).

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